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Editorial

Climate change adaptation pathways: Synergies, contradictions and tradeoffs across scales

The world's poor are frequently considered to be the most vulnerable to climate change (Niang et al., 2014), and thus most in need of adaptation to reduce the harms and risks climate change poses to their lives and livelihoods. As climate change adaptation projects are increasingly linked to socioeconomic development, scholars have recognized that planned adaptation interventions must go beyond abating climate risk and address the various "structural deficits," such as lack of income, education, health, and political power (Lemos et al., 2016) that make people vulnerable to climate change in the first place (Agrawal and Lemos, 2015). Without an understanding of what makes people vulnerable and how vulnerability is distributed across a population, as well as how climate change interacts with multiple other social-ecological stressors, climate change adaptation interventions risk inadvertently creating new vulnerabilities or eroding existing adaptive capacities (Agrawal, 2009; Burnham et al., 2013; Eriksen et al., 2011; Lemos et al., 2007). Likewise, adaptation projects that fail to form synergies with the ways people perceive and manage risk as it emerges from the specific relationships between the environment, economy, and society (Carr, 2008) that shape local social-ecological contexts risk contradicting local adaptive capacities, agricultural management practices, social relations, and institutions (Agrawal, 2009; Burnham et al., 2015; Crane et al., 2011; Eriksen et al., 2011; Lemos et al., 2007; Naess, 2013).

To address these concerns, recent research has conceptualized adaptation as a dynamic process in which adaptation decisions are made and implemented at multiple scales and influenced by various interacting stressors (Burnham and Ma, 2016; Leichenko and O'Brien, 2008; Tucker et al., 2010; Thornton and Manafsi, 2010; Wise et al., 2014). In particular, scholars have demonstrated how interactions between institutions, defined as the "formal and informal mechanisms that shape social and individual expectations, interactions, and behavior" (Agrawal & Perrin, 2009: p 351), influence how climate risk is experienced by local actors, as well as their adaptation strategies (Agrawal, 2009; Agrawal et al., 2012). Additionally, there is growing appreciation that the social, economic, political, cultural, institutional, and environmental arrangements that shape climate change vulnerability and adaptive capacities are the product of historical processes that create path dependencies and shape future adaptation possibilities (Eakin et al., 2016; Fazey et al., 2016; Smith et al., 2011). Likewise, others have demonstrated that research focused on adaptation decision-making at a single scale (e.g., autonomous household adaptation or planned adaptation by governments) fails to capture how adaptation actions taken at one scale are reflective of cross-scalar processes, including interactions between individuals, households, communities, and the nation state (Adger, 2001; Adger et al., 2005; Osbahr et al., 2008). Yet, limited attention has been directed at empirically understanding interactions between adaptation practices developed and implemented at different but linked scales and the question of how contradictions and synergies between them shape adaptation pathways and outcomes.

The papers in this special issue are motivated by this empirical gap and arose out of the 4th international conference of the Initiative on Climate Adaptation Research and Understanding through the Social Sciences (ICARUS) in 2015 in Urbana, Illinois, USA. At this conference, scholars from around the world came together to share ongoing research on climate change adaptation, critically examine the state of knowledge and literature from a wide range of disciplines, and collectively identify knowledge gaps that need to be addressed to provide insights for future climate change adaptation projects. Brought together by a common interest in further exploring the conceptualization and operationalization of adaptation pathways concept, a smaller group of scholars who are contributors to this special issue gathered again in the spring of 2016 to further develop the papers included here.

The aim of this special issue is to contribute to emerging discussions in the climate change adaptation literature that highlight the importance of understanding and theorizing the scalar dimensions of adaptation and adaptation pathways. Drawing on a set of geographically diverse case studies, the papers use different theoretical and methodological lenses to examine the multi-scalar social, economic, political, cultural, and institutional processes embedded in climate change adaptation planning, decisions, and outcomes in order to understand the synergies, contradictions, and tradeoffs between adaptation practices initiated at different scales. In particular, many of the papers move beyond questions of what shapes the types of adaptation local actors undertake to investigate how adaptation practices across scales are implemented and interact over time. Thus, these papers understand adaptations not as discrete actions made in response to particular instances of change, but rather as dynamic and continually unfolding pathways. Conceptualizing adaptation in this way allows scholars to identify "patterns that explain how and why change occurs and how this results in particular outcomes" (Fazey et al., 2016: p. 28). Overall, the papers in this special issue address climate change adaptation synergies, contradictions, and tradeoffs across scales through three broad, overarching lenses: (1) the role of institutions in shaping local adaptation pathways; (2) adaptation pathways as shaped by interactions between past and present practices, processes, and

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vulnerabilities; and (3) triggers of adaptation at individual, household, and community scales and their synergies and contradictions with the goals and practices embedded in higher-scale adaptation decision processes.

Specifically, the paper by Fischer (2018) uses a pathways approach to examine how adaptation processes in six historically natural-resource-dependent coastal communities in Oregon, USA, are shaped by interactions between past and present vulnerabilities and adaptation decisions. Based on semi-structured interviews with 71 community members, the author finds mismatches between small coastal communities' adaptation priorities and those of state and regional actors. Whereas local communities are primarily concerned with day-to-day struggles related to economic decline and demographic change, state and regional actors tend to focus more on major potential future threats, such as natural hazards and risks associated with climate change. Overall, her work points to the need for policy makers and planners to incorporate livelihood improvement strategies that address the root causes of vulnerability into climate change adaptation policies.

Burnham and Ma (2018) employ a multi-scalar pathways approach to investigate the synergies and contradictions between adaptation practices developed and implemented at different but linked scales in the Loess Plateau region of China. Drawing on 93 smallholder interviews, the authors demonstrate how the household-level adaptation strategy of planting maize emerges from interacting social, economic, political, institutional, and environmental contexts in which smallholders live and work. Similarly, the authors show how the government-sponsored adaptation of drip irrigation failed because it created contradictions with the adaptation pathways emerged through the planting of maize, resulting in tensions with the ways smallholders use maize to manage various forms of uncertainty and risk and with the social and institutional relations embedded in their day-to-day lives. Overall, this work points to the need for adaptation research to investigate how adaptation pathways arise out of particular social-ecological contexts, why some adaptation strategies fail, and the range of risks, barriers, opportunities, and incentives to which smallholders respond as they navigate a changing climate.

Next, Radel, Schmook, Carte, and Mardero (2018) scrutinize how labor migration is related to climate change and climate change adaptation in northwestern Nicaragua. Using a political ecological approach and drawing on interviews and surveys with 120 smallholder households across six communities, the authors show how labor migration neither facilitates adaptation to climate change nor reflects a failure to adapt, but rather is indicative of the weak position of smallholders in interlocking relations of power. Their work challenges the common narrative that positions labor migration as an outcome of smallholders failing to adapt their agricultural systems to environmental change. Instead, they demonstrate that uneven access to land, inequality in land tenure, and lack of access to credit interact with a changing climate to shape the adaptation pathways of smallholders and co-produce labor migration. Overall, this work argues that achieving climate change adaptation at the local level requires longer-term policy support that takes into account the larger structural deficits facing smallholders, particularly their power within markets.

The paper by Rasmussen (2018) shows how higher-scale adaptation policies get re-defined when implemented locally. The author examines adaptation strategies *across* scales by drawing on longitudinal data collected in two agropastoralist villages and interviews with organizational personnel involved in regional and national adaptation planning in Burkina Faso. She finds that higher-scale adaptation policies remain technical in nature and aim to boost agricultural food production, whereas local adaptation strategies are primarily pursued to secure off-farm income and animal fodder. This work points to a need for higher-scale adaptation policies to better recognize and complement local contexts and aspirations. This will require that higher-scale adaptation policies are developed in parallel with local adaptation actions fostered by a broad range of factors beyond climate change.

Drawing on the concept of performativity, Wernersson (2018) considers how social identities are linked to livestock management practice in order to investigate how such identities present both challenges and opportunities for the development of adaptation interventions. Building upon extensive ethnographic fieldwork with pastoralists and agropastoralists in Kenya, the author illuminates how livestock management practices and social identity co-construct one another. This work points to the importance of considering how social identities shape the adaptation choices made by people, as well as how the development of adaptation policies and plans interact with social identities to shape their outcomes.

McCord, Waldman, Baldwin, Dell'Angelo, and Evans (2018) argue that the literature examining smallholder adaptation has focused on how household attributes shape adaptation actions, while ignoring community-level factors that facilitate adaptation actions, particularly in cases where individual and community-level incentives are different. Drawing on a survey conducted in 25 communities in the Mount Kenya region of Kenya, the authors examine how household attributes and the institutional arrangements of community irrigation systems shape smallholder adaptive behavior. In particular, they demonstrate that smallholders' willingness to adopt new seed varieties as an adaptive behavior is influenced by household attributes, such as decreased water availability, and the institutional arrangements that govern community irrigation systems. Overall, this work argues that institutional dynamics at the community level in part determine household adaptation decisions, and that solely focusing on household attributes gives an incomplete understanding of smallholder adaptive behavior.

Next, Hunsberger, Work, and Herre (2018) investigate how state-, corporate-, and donor-led irrigation projects for climate change adaptation and biofuel production for climate change mitigation affect local-level patterns of land and water access in the Greater Aural region of Cambodia. The authors situate their work at the landscape scale to capture the impacts of climate change interventions across multiple resource-based livelihoods and scales. Specifically, the authors examine how the aggregated impacts of climate change adaptation strategies interact with people's livelihoods and the resource base on which they depend to create or exacerbate environmental conflicts. They find that responses to climate change are degrading water and soil resources and limiting access to natural resources, shaping future adaptation pathways. Overall this work shows that the effects of climate change interventions are not only felt at the project site during the project implementation period, but in other places and across time.

Tian and Lemos (2018) examine how non-farm income shapes the vulnerability of smallholder households to environmental hazards. Using a livelihoods approach, the authors analyze household survey data from eight villages around the Poyang Lake of China to investigate how cross-scale economic development processes and risk management infrastructure such as levees, interact to mediate the exposure, sensitivity, and adaptive capacity of rural households to flooding. The authors show that the development of non-farm economic opportunities in the Poyang Lake region, coupled with the development of flood risk management infrastructure, have increased the adaptive capacity of smallholder households and reduced their sensitivity to environmental hazards. Overall, this work presents a unique example demonstrating how synergies

can be produced between state-led regional development projects and smallholder climate change adaptation.

Finally, Graham, Barnett, Mortreux, Hurlimann, and Fincher (2018) explore how understanding the lived values of local residents can help inform the development of fairer local climate change adaptation plans. The authors analyze household survey data from residents in four small coastal communities in Victoria, Australia who are vulnerable to sea-level rise. They discover the presence of five distinct types of residents in these communities, each with their own set of lived values related to their region and the histories of their communities. The authors demonstrate how people's experiences of place and the lived values they produce have important implications for how climate change adaptation projects will be experienced. Likewise, they show how synergies, contradictions and tradeoffs created by adaptation have subjective social and spatial dimensions that go beyond material and economic outcomes. Overfall, this work suggests that for adaptation planning and policy to be successful, decision makers must consider how climate change will interact with the lived values of those who are vulnerable to its impacts.

In brief, the nine papers presented here collectively contribute to better understanding the various climatic and non-climatic stressors and processes that shape adaptation of both rural and urban poor over time. They also contribute to emerging discussions of the multi-scalar nature of adaptation, demonstrating the value of conceptualizing it as dynamic and continually unfolding pathways rather than discrete actions made at different points in time. All nine papers included here also demonstrate in their own context the synergies, contradictions, and tradeoffs amongst adaptation processes at different but linked scales. Such understanding is important for informing the design of future adaptation policies and projects so that they are less likely to create new vulnerabilities or circumscribe the potential for adaptation in their target communities.

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Morey Burnham
Department of Sociology, Social Work, and Criminology, Idaho State University, United States
E-mail address: burnmore@isu.edu

Laura Vang Rasmussen
Department of Forest & Conservation Sciences, University of British Columbia, Canada; Forests and Livelihoods: Assessment, Research and Engagement (FLARE) Network, United States
E-mail address: lr@ign.ku.dk

Zhao Ma
Department of Forestry and Natural Resources, Purdue University, United States
E-mail address: zhaoma@purdue.edu